Metallized Polyester (PET) SMD Film Capacitors with Box Encapsulation

Special Features

- Size codes 1812, 2220, 2824, 4030, 5040 and 6054 with PET and encapsulated
- Operating temperature up to 100°C
- Self-healing
- According to RoHS 2002/95/EC

Typical Applications

For general DC-applications e.g.
- By-pass
- Blocking
- Coupling and decoupling
- Timing

Construction

Dielectric:
Polyethylene-terephthalate (PET) film

Capacitor electrodes:
Vacuum-deposited

Internal construction:
Plastic film
Vacuum-deposited electrodes
Metal (schoopage)
Terminating plate

Encapsulation:
Solvent-resistant, flame-retardant plastic case, UL 94 V-0

Terminations:
Tinned plates.

Marking:
Box colour: Black.

Electrical Data

| Capacitance range: | 0.01 µF to 6.8 µF |
|Rated voltages: | 63 VDC, 100 VDC, 250 VDC, 400 VDC, 630 VDC, 1000 VDC |
|Capacitance tolerances: | ±20%, ±10% (±5% available subject to special enquiry) |

Operating temperature range:
-55°C to +100°C (±125°C available subject to special enquiry)

Climatic test category:
55/100/21 according to IEC for size codes 1812 to 2824
55/100/56 according to IEC for size codes 4030 to 6054

Insulation resistance at +20°C:

<table>
<thead>
<tr>
<th>U_r</th>
<th>U_test</th>
<th>C ≤ 0.33 µF</th>
<th>0.33 µF &lt; C ≤ 6.8 µF</th>
</tr>
</thead>
<tbody>
<tr>
<td>63 VDC</td>
<td>50 V</td>
<td>≥ 3.75 x 10^3 MΩ (mean value: 1 x 10^4 MΩ)</td>
<td>≥ 1250 sec (MΩ x µF) (mean value: 3000 sec)</td>
</tr>
<tr>
<td>100 VDC</td>
<td>100 V</td>
<td>≥ 1 x 10^4 MΩ (mean value: 5 x 10^4 MΩ)</td>
<td>≥ 3000 sec (MΩ x µF) (mean value: 10000 sec)</td>
</tr>
</tbody>
</table>

Dissipation factors at +20°C; tan δ

<table>
<thead>
<tr>
<th>at f</th>
<th>C ≤ 0.1 µF</th>
<th>0.1 µF &lt; C ≤ 1.0 µF</th>
<th>C &gt; 1.0 µF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kHz</td>
<td>≤ 8 x 10^-3</td>
<td>≤ 8 x 10^-3</td>
<td>≤ 10 x 10^-3</td>
</tr>
<tr>
<td>10 kHz</td>
<td>≤ 15 x 10^-3</td>
<td>≤ 15 x 10^-3</td>
<td>–</td>
</tr>
<tr>
<td>100 kHz</td>
<td>≤ 30 x 10^-3</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Maximum pulse rise time:
For pulses equal to the rated voltage

<table>
<thead>
<tr>
<th>Capacitance µF</th>
<th>Pulse rise time V/µsec max. operation/test</th>
</tr>
</thead>
<tbody>
<tr>
<td>63 VDC</td>
<td>100 VDC</td>
</tr>
<tr>
<td>0.01 ... 0.022</td>
<td>30/300</td>
</tr>
<tr>
<td>0.033 ... 0.068</td>
<td>20/200</td>
</tr>
<tr>
<td>0.1 ... 0.22</td>
<td>10/100</td>
</tr>
<tr>
<td>0.33 ... 0.68</td>
<td>8/80</td>
</tr>
<tr>
<td>1.0 ... 2.22</td>
<td>3.5/35</td>
</tr>
<tr>
<td>3.3 ... 6.8</td>
<td>3/3</td>
</tr>
</tbody>
</table>

Dip Solder Test/Processing

Resistance to soldering heat:
Test Tb in accordance with DIN IEC 60068-2-58/DIN EN 60384-19.
Soldering bath temperature max. 260°C.
Soldering duration max. 5 sec.
Change in capacitance ΔC/C < 5%.
Soldering process:
Wave soldering and re-flow soldering (see temperature/time graphs page 12).

Packing

Available taped and reeled in 12 mm blister pack.
Detailed taping information and graphs at the end of the catalogue.
For further details and graphs please refer to Technical Information.
### General Data

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>63 VDC/40 VAC*</th>
<th>100 VDC/63 VAC*</th>
<th>250 VDC/160 VAC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 µF</td>
<td>1812 3.0</td>
<td>1812 3.0</td>
<td>1812 4.0</td>
</tr>
<tr>
<td></td>
<td>2220 3.5</td>
<td>2220 3.5</td>
<td>2220 3.5</td>
</tr>
<tr>
<td></td>
<td>2824 3.0</td>
<td>2824 3.0</td>
<td>2824 3.0</td>
</tr>
<tr>
<td>0.015 µF</td>
<td>1812 3.0</td>
<td>1812 3.0</td>
<td>1812 4.0</td>
</tr>
<tr>
<td></td>
<td>2220 3.5</td>
<td>2220 3.5</td>
<td>2220 3.5</td>
</tr>
<tr>
<td></td>
<td>2824 3.0</td>
<td>2824 3.0</td>
<td>2824 3.0</td>
</tr>
<tr>
<td>0.022 µF</td>
<td>1812 3.0</td>
<td>1812 3.0</td>
<td>1812 4.0</td>
</tr>
<tr>
<td></td>
<td>2220 3.5</td>
<td>2220 3.5</td>
<td>2220 3.5</td>
</tr>
<tr>
<td></td>
<td>2824 3.0</td>
<td>2824 3.0</td>
<td>2824 3.0</td>
</tr>
<tr>
<td>0.033 µF</td>
<td>1812 3.0</td>
<td>1812 3.0</td>
<td>1812 4.0</td>
</tr>
<tr>
<td></td>
<td>2220 3.5</td>
<td>2220 3.5</td>
<td>2220 3.5</td>
</tr>
<tr>
<td></td>
<td>2824 3.0</td>
<td>2824 3.0</td>
<td>2824 3.0</td>
</tr>
</tbody>
</table>

* AC voltage: \( f = 50 \text{ Hz}, \ 1.4 \times U_{\text{rms}} + U_{\text{DC}} \leq U_{\text{r}} \)

- Dims. in mm.
- Rights reserved to amend design data without prior notification.

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**Part number completion:**

- **Tolerance:** 20% = M, 10% = K, 5% = J
- **Packing:** bulk = S
- **Pin length:** none = 00

Taped version see page 126.
Continuation

General Data

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>Size code</th>
<th>400 VDC/200 VAC*</th>
<th>Size code</th>
<th>630 VDC/300 VAC*</th>
<th>Size code</th>
<th>1000 VDC/400 VAC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 μF</td>
<td>2824</td>
<td>3.0</td>
<td>4030</td>
<td>5.0</td>
<td></td>
<td></td>
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<td></td>
<td>4030</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>0.015 μF</td>
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<td>3.0</td>
<td>4030</td>
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<td>6.0</td>
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<td>5.0</td>
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<td></td>
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<tr>
<td>0.022 μF</td>
<td>2824</td>
<td>3.0</td>
<td>5040</td>
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<td>5040</td>
<td>6.0</td>
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<td></td>
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<tr>
<td>0.033 μF</td>
<td>2824</td>
<td>5.0</td>
<td>5040</td>
<td>6.0</td>
<td>5040</td>
<td>6.0</td>
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<tr>
<td></td>
<td>4030</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.047 μF</td>
<td>2824</td>
<td>5.0</td>
<td>6054</td>
<td>7.0</td>
<td>6054</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>4030</td>
<td>5.0</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.068 μF</td>
<td>4030</td>
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<td>5040</td>
<td>6.0</td>
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<td></td>
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<tr>
<td>0.1 μF</td>
<td>4030</td>
<td>5.0</td>
<td>6054</td>
<td>7.0</td>
<td>6054</td>
<td>7.0</td>
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<tr>
<td></td>
<td>5040</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.15 μF</td>
<td>4030</td>
<td>5.0</td>
<td>6054</td>
<td>7.0</td>
<td>6054</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>5040</td>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.22 μF</td>
<td>5040</td>
<td>6.0</td>
<td>6054</td>
<td>7.0</td>
<td>6054</td>
<td>7.0</td>
</tr>
<tr>
<td>0.33 μF</td>
<td>5040</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0.47 μF</td>
<td>6054</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* AC voltage: f = 50 Hz; 1.4 x U_{rms} + U_{DC} ≤ U_r

Dims. in mm.

The values of the WIMA SMD-PEN range according to the main catalogue 2009 are still available on request.

Solder pad recommendation

Part number completion:
- Tolerance: 20 % = M
- 10 % = K
- 5 % = J

Packing: bulk = S
Pin length: none = 00
Taped version see page 126.

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Recommendation for Processing and Application of SMD Capacitors

**Layout Form**

The components can generally be positioned on the carrier material as desired. In order to prevent soldering shadows or ensure regular temperature distribution, extreme concentration of the components should be avoided. In practice, it has proven best to keep a minimum distance of the soldering surfaces between two WIMA SMDs of twice the height of the components.

**Solder Pad Recommendation**

The solder pad size recommendations given for each individual series are to be understood as minimum dimensions which can at any time be adjusted to the layout form.

**Processing**

The processing of SMD components

- assembling
- soldering
- electrical final inspection/ calibrating

must be regarded as a complete process. The soldering of the printed circuit board, for example, can constitute considerable stress on all the electronic components. The manufacturer’s instructions on the processing of the components are mandatory.

**Soldering Process**

Due to the diverse procedures and the varying heat requirements of the different types of components, an exact processing temperature for re-flow soldering processes cannot be specified. The graph shows the upper limits of temperature and time which must not be exceeded when establishing the solder profile according to your actual requirements.

A max. temperature of \( T = 210\degree C \) inside the components should not be exceeded when processing WIMA SMD capacitors.

**SMD Handsoldering**

WIMA SMD capacitors with plastic film dielectric are generally suitable for hand-soldering with a soldering iron where, however, similar to automated soldering processes, a certain duration and temperature should not be exceeded. These parameters are dependent on the physical size of the components and the relevant heat absorption involved.

<table>
<thead>
<tr>
<th>Size code</th>
<th>Temperature °C / °F</th>
<th>Time duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1812</td>
<td>225 / 437</td>
<td>2 sec plate 1 / 5 sec off / 2 sec plate 2</td>
</tr>
<tr>
<td>2220</td>
<td>225 / 437</td>
<td>3 sec plate 1 / 5 sec off / 3 sec plate 2</td>
</tr>
<tr>
<td>2824</td>
<td>250 / 482</td>
<td>3 sec plate 1 / 5 sec off / 3 sec plate 2</td>
</tr>
<tr>
<td>4030</td>
<td>260 / 500</td>
<td>5 sec plate 1 / 5 sec off / 5 sec plate 2</td>
</tr>
<tr>
<td>5040</td>
<td>260 / 500</td>
<td>5 sec plate 1 / 5 sec off / 5 sec plate 2</td>
</tr>
<tr>
<td>6054</td>
<td>260 / 500</td>
<td>5 sec plate 1 / 5 sec off / 5 sec plate 2</td>
</tr>
</tbody>
</table>

The below data are to be regarded as guideline values and should serve to avoid damage to the dielectric caused by excessive heat during the soldering process. The soldering quality depends on the tool used and on the skill and experience of the person with the soldering iron in hand.
**Solder Paste**

To obtain the best soldering performance we suggest the use of following solder paste alloy:

- Lead free solder paste
  - Sn - Bi
  - Sn - Zn (Bi)
  - Sn - Ag - Cu

- Solder paste with lead
  - Sn - Pb - Ag (Sn60-Pb40-A, Sn63-Pb37-A)

**Initial Operation/Calibration**

Due to the stress which the components are subjected to during processing, reversible parameter changes occur in almost all electronic components. The capacitance recovery accuracy to be expected with careful processing is within a scope of

\[ |\Delta C/C| \leq 5\% \]

For the initial operation of the device a minimum storage time of

\[ t \geq 24 \text{ hours} \]

is to be taken into account. With calibrated devices or when the application is largely dependent on capacitance it is advisable to prolong the storage time to

\[ t \geq 10 \text{ days} \]

In this way ageing effects of the capacitor structure can be anticipated. Parameter changes due to processing are not to be expected after this period of time.

**Reliability**

Taking account of the manufacturer’s guidelines and compatible processing, the WIMA SMD stand out for the same high quality and reliability as the analogous through-hole WIMA series. The technology of metallized film capacitors used e.g. in WIMA SMD-PET achieves the best values for all fields of application. The expected value is about:

\[ \lambda_0 \leq 2 \text{ fit} \]

Furthermore the production of all WIMA components is subject to the regulations laid down by ISO 9001:2008 as well as the guidelines for component specifications set out by IEC quality assessment system IECQ-CECCI for electronic components.

**Humidity Protection Bags**

Taped WIMA SMD capacitors are shipped in humidity protection bags according to JEDEC standard, level 1 IEMI/static-shielding bags conforming to MIL-B 81705, Type 1, Class 11. Under controlled conditions the components can be stored two years and more in the originally sealed bag. Opened packing units should be consumed instantly or resealed for specific storage under controlled conditions.

**Electrical Characteristics and Fields of Application**

Basically the WIMA SMD series have the same electrical characteristics as the analogous through-hole WIMA capacitors. Compared to ceramic or tantalum dielectrics WIMA SMD capacitors have a number of other outstanding qualities:

- favourable pulse rise time
- low ESR
- low dielectric absorption
- available in high voltage series
- large capacitance spectrum
- stand up to high mechanical stress
- good long-term stability

As regards technical performance as well as quality and reliability, the WIMA SMD series offer the possibility to cover nearly all applications of conventionally through-hole film capacitors with SMD components. Furthermore, the WIMA SMD series can now be used for all the demanding capacitor applications for which, in the past, the use of through-hole components was mandatory:

- measuring techniques
- oscillator circuits
- differentiating and integrating circuits
- A/D or D/A transformers
- sample and hold circuits
- automotive electronics

With the WIMA SMD programme available today, the major part of all plastic film capacitors can be replaced by WIMA SMD components. The field of application ranges from standard coupling capacitors to use in switch-mode power supplies as filter or charging capacitors with high voltage and capacitance values, as well as in telecommunications e.g. the well-known telephone capacitor 1µF/250VDC.
Blister Tape Packaging and Packing Units of the WIMA SMD Capacitors

Tape reel:

Tape advance and return:

All dims. in mm.

<table>
<thead>
<tr>
<th>Type</th>
<th>W&lt;sub&gt;max&lt;/sub&gt;</th>
<th>W&lt;sub&gt;max&lt;/sub&gt;</th>
<th>N ± 1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1812</td>
<td>19</td>
<td>12.4</td>
<td>62</td>
</tr>
<tr>
<td>2220</td>
<td>19</td>
<td>12.4</td>
<td>62</td>
</tr>
<tr>
<td>2824</td>
<td>19</td>
<td>12.4</td>
<td>62</td>
</tr>
<tr>
<td>4030</td>
<td>22.4</td>
<td>16.4</td>
<td>60</td>
</tr>
<tr>
<td>5040</td>
<td>30.4</td>
<td>24.4</td>
<td>90</td>
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<tr>
<td>6054</td>
<td>30.4</td>
<td>24.4</td>
<td>90</td>
</tr>
</tbody>
</table>

Packing units

<table>
<thead>
<tr>
<th>Code</th>
<th>taped Reel 180 mm Ø</th>
<th>taped Reel 330 mm Ø</th>
<th>bulk</th>
</tr>
</thead>
<tbody>
<tr>
<td>KA</td>
<td>750</td>
<td>1000</td>
<td>3000</td>
</tr>
<tr>
<td>KB</td>
<td>500</td>
<td>1000</td>
<td>3000</td>
</tr>
<tr>
<td>QA</td>
<td>500</td>
<td>1000</td>
<td>3000</td>
</tr>
<tr>
<td>QB</td>
<td>400</td>
<td>1000</td>
<td>3000</td>
</tr>
<tr>
<td>TA</td>
<td>1500</td>
<td>500</td>
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</tr>
<tr>
<td>TB</td>
<td>750</td>
<td>500</td>
<td>2000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>taped Reel 330 mm Ø</th>
<th>bulk</th>
</tr>
</thead>
<tbody>
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<td>XA</td>
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</tr>
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<td>YA</td>
<td>600</td>
<td>200</td>
</tr>
<tr>
<td>YB</td>
<td>450</td>
<td>100</td>
</tr>
</tbody>
</table>

Part number codes for SMD packing

<table>
<thead>
<tr>
<th>W (Blister)</th>
<th>Ø in mm</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>180</td>
<td>P</td>
</tr>
<tr>
<td>12</td>
<td>330</td>
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<td>16</td>
<td>330</td>
<td>R</td>
</tr>
<tr>
<td>24</td>
<td>330</td>
<td>T</td>
</tr>
<tr>
<td>Bulk Standard</td>
<td></td>
<td>S</td>
</tr>
</tbody>
</table>

* Cumulative after 10 steps ± 0.2 mm max. Samples and pre-production needs on request or 1 Reel minimum.
WIMA Part Number System

A WIMA part number consists of 18 digits and is composed as follows:

- **Field 1 - 4:** Type description
- **Field 5 - 6:** Rated voltage
- **Field 7 - 10:** Capacitance
- **Field 11 - 12:** Size and PCM
- **Field 13 - 14:** Special features (e.g., Snubber versions)
- **Field 15:** Capacitance tolerance
- **Field 16:** Packing
- **Field 17 - 18:** Lead length (untaped)

### Type description:

- SMD-PET = SMDDT
- SMD-PS = SMDD1
- FK 02 = FKDD0
- MKS 02 = MKSDD0
- FS 2 = FSDK2
- FK 2 = FSDK2
- MK 2 = MKSD2
- MKS 2 = MKSDD2
- FS 3 = FSDK3
- FK 3 = FSDK3
- MK 4 = MKSDD4
- MKS 4 = MKSDD4
- MKP 10 = MKPS10
- FK 4 = FSDK4
- FKI = FSDK1
- MKP X2 = MKSDX2
- MKP X2 R = MKSDXR
- MKP Y2 = MKSDY2
- MP 3-X2 = MPPDX2
- MP 3-X1 = MPDMPX1
- MP 3-Y2 = MPDMPY2
- MP 3R-Y2 = MPDMPRY2
- Snubber MKP = SNNMPD
- Snubber FK = SFSNFP
- GT0 MKP = GTDGT0M
- DC-LINK MKP 4 = DCPD4
- DC-LINK MKP 5 = DCPD5
- DC-LINK MKP 6 = DCPD6
- DC-LINK HC = DCHDC
- SuperCap C = SCSC
- SuperCap MC = SCMC
- SuperCap R = SCRSR
- SuperCap MR = SCSR

### Rated voltage:

- 2.5 VAC = A1
- 4 VAC = A2
- 14 VAC = A3
- 28 VAC = A4
- 40 VAC = A5
- 5 VDC = A6
- 50 VDC = A6
- 63 VDC = A6
- 100 VDC = A6
- 1000 VDC = A6
- 4700 pF = A6
- 470 pF = A6
- 1000 pF = A6
- 680 pF = A6
- 1000 pF = A6
- 1500 pF = A6
- 2000 pF = A6
- 10000 pF = A6

### Capacitance:

- 22 pF = 0002
- 47 pF = 0007
- 100 pF = 0010
- 150 pF = 0015
- 220 pF = 0022
- 330 pF = 0033
- 470 pF = 0047
- 750 pF = 0075
- 2200 pF = 0220
- 3300 pF = 0330
- 4700 pF = 0470
- 7500 pF = 0750
- 22000 pF = 0220
- 33000 pF = 0330
- 47000 pF = 0470
- 75000 pF = 0750

### Size:

- 4.8 x 3.3 x 3 Size 1812 = KA
- 4.8 x 3.3 x 4 Size 1812 = KB
- 5.7 x 5.1 x 3.5 Size 2220 = QA
- 5.7 x 5.1 x 4.5 Size 2220 = QB
- 7.2 x 6.1 x 3 Size 2824 = TA
- 7.2 x 6.1 x 5 Size 2824 = TB
- 10.2 x 7.6 x 5 Size 4030 = VA
- 12.8 x 10.2 x 6 Size 5040 = XA
- 15.3 x 13.7 x 7 Size 6054 = YA
- 2.5 x 7 x 4.6 PCM 2.5 = OB
- 3.75 x 4.6 PCM 2.5 = OC
- 2.5 x 6.5 x 7.2 PCM 5 = OA
- 3 x 7.5 x 7.2 PCM 5 = OB
- 2.5 x 7 x 10 PCM 7 = OC
- 3 x 8.5 x 10 PCM 7 = OD
- 3 x 9 x 13 PCM 10 = OA
- 4.9 x 13 PCM 10 = OB
- 5 x 11 x 18 PCM 15 = OA
- 6 x 12.5 x 18 PCM 15 = OB
- 5.6 x 14 x 26.5 PCM 22 = OC
- 6 x 15 x 26.5 PCM 22 = OD
- 9 x 19 x 31.5 PCM 27.5 = OA
- 11 x 21 x 31.5 PCM 27.5 = OB
- 9 x 19 x 41.5 PCM 37.5 = OB
- 11 x 21 x 41.5 PCM 37.5 = OC
- 94 x 49 x 182 DCH = OA
- 94 x 77 x 182 DCH = OB

### Tolerance:

- 20% = M
- 10% = K
- 5% = J
- 2.5% = H
- 1% = E
- ... 

### Packing:

- AMMO H16.5 340 x 340 = A
- AMMO H16.5 340 x 370 = B
- AMMO H18.5 340 x 340 = C
- AMMO H18.5 490 x 370 = D
- REEL H16.5 360 = F
- REEL H16.5 500 = H
- REEL H18.5 360 = I
- REEL H18.5 500 = J
- ROLL H16.5 = N
- ROLL H18.5 = O
- BLUSTER W12 180 = P
- BLUSTER W12 330 = Q
- BLUSTER W16 330 = R
- BLUSTER W24 330 = T
- Bulk Standard = S
- TPS Standard = Y
- ... 

### Lead length (untaped):

- 3.5 ± 0.5 = C9
- 6 ± 2 = SD
- 16 ± 1 = P1

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The data on this page is not complete and serves only to explain the part number system. Part number information is listed on the pages of the respective WIMA range.